The changing North Woods and moose
Scenario planning to inform land and wildlife management

Broadening engagement and information exchange
Project update No. 3

Scenario planning, while not a new process, is relatively new to applications in conservation and natural resource management. Not surprisingly, managers want to learn about scenario planning to help them understand whether incorporating it into their current planning processes will provide desired outcomes and is the best use of their time. This newsletter summarizes the recently attended Northeast Moose Group Meeting as well as a session on scenario planning at the Northeast Association of Fish and Wildlife Agencies (NEAFWA) annual meeting highlighting ongoing efforts in the region. The aim in broadening our engagement is to share information, exchange ideas, and build from others' endeavors with relevance to our project.

Conversations among the management community: Northeast Moose Group Meeting

In July, the Maine Department of Inland Fisheries and Wildlife hosted the 2015 Northeast Moose Group Meeting. Representatives from the states of Connecticut, Maine, Massachusetts, New Hampshire, New York and Vermont and Ontario, as well as the academic research community, made up the group. The meeting provided an opportunity to discuss questions about moose management issues and share research results of mutual interest.

Unraveling the story: moose across the Northeast United States and Canada

Recent research has focused on the causes behind changing productivity and growth rates in moose populations observed in parts of the Northeast's core moose habitat (Maine, New Hampshire, northern Vermont, and Ontario) and the current and future implications for management. The unfolding story is complex, and factors driving population trends vary between, and within, management jurisdictions. Managers in areas where there is evidence of reductions in moose density suspect that winter tick is a key player. They are also looking closely at interactions between ticks and changing conditions that support the parasite's prevalence, such as climate, host densities (moose and deer), and habitat availability and use. Other areas where moose are numerous (Quebec, New Brunswick, northern Maine), are not documenting comparable reductions. New York and Massachusetts appear to have low or no winter ticks and lower road mortality in recent years but are unsure of current population numbers.
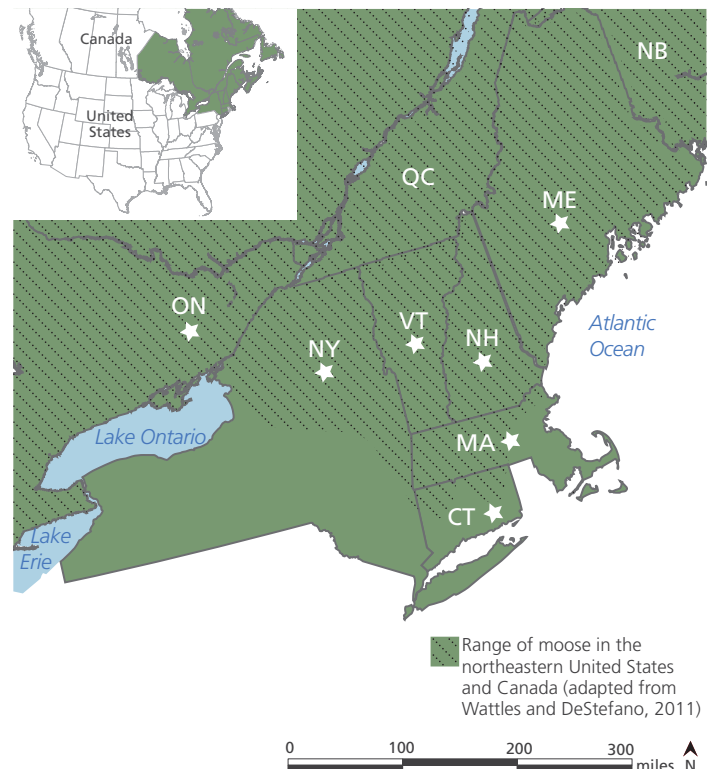
Studies underway in many states and provinces are looking at calf mortality and its causes, as well as overall moose condition, tick loads, and associated spring (March-May) hair loss. Tissue and blood samples are also being examined for indicators of parasites (e.g., brainworm, lungworm) and disease as contributing factors. Information comes from mark-recapture efforts, aerial survey, road mortality, and hunting stations.

Research contributes to improved understanding of moose population dynamics

While research contributes to improved understanding of moose population dynamics, uncertainty prevails, especially with regard to the ability of managers to respond to changing

Moose in Somerset County, Maine. Source: M. Vigue.

Range of moose in the northeastern United States and Canada (adapted from Wattles and DeStefano, 2011)

States such as New York, Massachusetts, and Conneticut are less certain about population numbers than the northern New England states and the Canadian provinces. The stars on the map indicate which locations participated in 2015's Moose Meeting.

environmental stressors. Management adjustments are being made. Managers in New Hampshire have been reducing the number of permits issued in management units since 2007; and in its recently revised game management plan, the state identified population thresholds for moose within each wildlife management unit that, should numbers drop below those levels, trigger the cessation of moose hunting. This is an example of building uncertainty in future conditions into present management plans.

Questions and uncertainty—could scenario planning help?

Ultimately, the working group discussions underscored the multiple factors at play in moose productivity and mortality associated with changing weather and climate, moose and deer density, and habitat conditions and use by moose that are expressed across the Northeast. Outreach aimed at sharing this inherent complexity and research results with the public (the decision maker in many states) is critical to informed decisions moving forward. Scenario planning is one tool that can support broad stakeholder engagement, develop shared understanding of complex issues, and proactively consider a range of potential options in light of uncertainties. Scenario planning is a decision support method that helps managers incorporate information about future changes in climate and other drivers into their management decisions. The development of future scenarios (of climate change, socioeconomic conditions, land use changes, and ecological responses) can help state and federal managers understand plausible ecological futures, vulnerabilities, and opportunities as a result of climate change and related stressors.

Scenario planning as a management tool throughout the Northeast United States

Increased awareness of the uncertainties associated with the effects of climate and other forces of change in ecological systems have challenged traditional planning and decision making for natural resource conservation and compelled practitioners to explore a broad range of decision support methods. Throughout the Northeast and Great Lakes Region, several ongoing scenario-planning efforts aim to inform natural resource conservation by identifying uncertainties and translating scenario narratives into management application. Presenters shared the projects below in a session at the NEAFWA meeting in Providence, RI in April.

Exploring climate change impacts on resources and management strategies
Isle Royale National Park, Lake Superior Michigan

National Park Service scientists and managers engaged in scenario planning to explore how climate change might impact park resources and management strategies in the near- to mid-term future (up to 2050). All scenarios projected an inevitable shift in vegetation from cool-adapted boreal to warm-adapted temperate plant species. However, the rate of vegetation change varied strongly among scenarios and depended on the type, strength, and timing of disturbances. The rate of ecosystem change and formation of novel communities will challenge management decisions that focus on preserving natural processes and native species. The scenarios are being used to inform management plans for vegetation and wildlife.

For more information about the National Park Service scenario planning efforts, contact
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| | Scenario | | | |
Resource	Least change	Summer drought, wind, and fire	Warmer than Duluth	Isle Savanna
Boreal forest	↓	↓	↓	↓
Temperate forest	↑	↓ Then ↑	↑	↑ Then ↓
Savanna	NA	NA	NA	↑

↓ Minor decrease ↑ Minor increase
↓ Major decrease ↑ Major increase

'Business as usual'. Continuing change of 3.4°F.

Disturbances eventually accelerate change. Punctuated event recovery.

Hotter conditions accelerate the gradual change.

Hot, drought, catastrophic event, Savanna conditions emerge.

The table above characterizes the potential effects of the Least Change and three other plausible futures on vegetation types in Isle Royale National Park. A temporal component is captured by the two arrows in some cells. Source: NPS

The ADK Futures project engages diverse stakeholders towards a common vision
Adirondack State Park, New York

Initiated in 2011 by the Common Ground Alliance, the ADK Futures project began with a series of multisectoral workshops aimed at collaboratively developing a vision and strategy for the Adirondack State Park. The scenario planning approach began with six different, divergent outcomes for the Park 25 years from now that encompassed a broad range of ideas and points of view. The scenario narratives are constructed from a series of events that lead to an endstate. The events represent specific actions or situations that take place at some point in the future. Once scenarios are built, "evidence" in the form of news stories are collected and recorded for various framework events to determine which are happening or not. Workshops in 2014–2015 have built off the original efforts to begin conversation about and start monitoring for the effects of climate change on Adirondack Park resources and communities.

Group photo from the Common Ground Alliance Forum of 2012, at which the results of the first workshop series were presented. Source: J. Herman

For more information on the ADK Futures project, contact Jim Herman, jim12924@gmail.com or visit ADKFutures.net

The New England Landscape Futures project works to inform policy and land use decisions
Northeast United States

The New England Landscape Futures project is a network of scientists, business owners, government officials, landowners, and non-profit representatives using divergent, exploratory scenarios to understand possible impacts of landscape change in the context of climate change in New England. Working together the network is developing qualitative scenario narratives, translating these narratives into quantitative simulations, comparing scenarios to current trends, and analyzing the consequences of these scenarios for ecosystem services important to stakeholders. The results will be used to inform policy and land use decisions about: forest management, land-use planning, green and grey infrastructure investment, and conservation priority setting. Several geo-spatial datasets have and are being developed as part of the process.


To learn more about the New England Landscape Futures project, contact Kathy Fallon Lambert, Science and Policy Integration Project Director, klambert01@fas.harvard.edu or visit s3rcn.org

Understanding uncertainties for future broad scale changes in the Lake Ontario Ecosystem
Lake Ontario Watershed

Broad scale changes in the Lake Ontario watershed and beyond are sources of uncertainties for understanding the future of the Lake ecosystem. A scenario process, led by New York Sea Grant, was implemented for the lake to explore the uncertain trajectories of ecosystem processes and expand the perspectives of the diverse groups that depend on the lake and its condition into the future. With funding from the Great Lakes Restoration Initiative, an initial workshop in 2012 developed four qualitative scenarios for the future of the Lake Ontario created in consultation with 32 diverse stakeholders and built around two key drivers, precipitation and human demographics. These scenarios were recently used in a follow-up exercise funded by the Great Lakes Integrated Science & Assessment (GLISA) to develop climate change adaptation language for consideration in a revision of the Lakewide Management Plan (LaMP) for Lake Ontario, an international guiding document for the management of each of the Great Lakes.
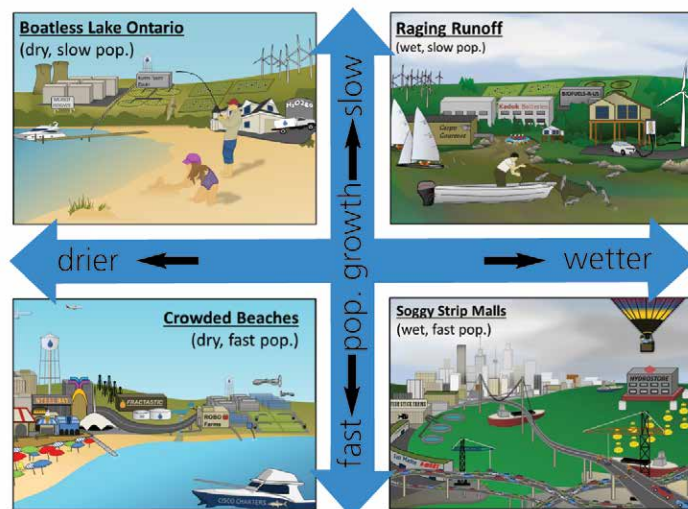
For more information on scenario planning and the Lake Ontario Watershed, contact David MacNeill, dbm4@cornell.edu

Graphical representation of scenarios developed for the Lake Ontario ecosystem. Drivers of change (axes) capture unknowns about future precipitation regimes and population growth for the watershed. Source: D. MacNeill

What's next for the moose project? Scenario refinement and applications

The upcoming months will see significant progress in honing the information pulled together to date, including preliminary scenarios, toward both refined regional scenarios for broad applications in the Northern forest and the development of scenarios for particular management applications.

The refinement of scenarios of Northern forest and climate change for the region will take place in early August 2015. A small group will meet at the Northeast Climate Science Center to develop draft products. These 'high-level' regional scenarios, as well as subsets that we will tailor to moose-specific issues, will be distributed for review by an expert group comprised of many who have engaged in the project to date. The final products will be available online for use, or as a starting point for further customization for other wildlife management applications.
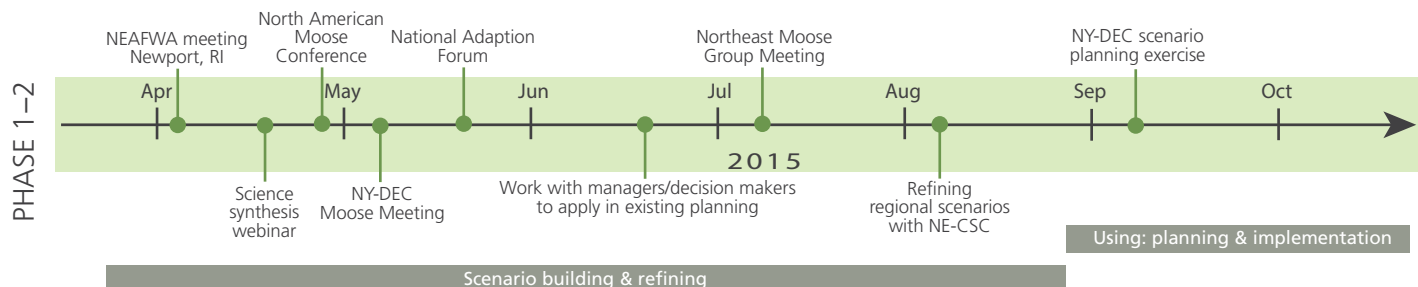
The first management application will be a 1-day scenario exercise with the New York Department of Environmental Conservation planned for September 2015. This meeting will build more Adirondack-specific scenarios from regional level and local inputs to explore potential management objectives for moose under alternative future conditions linked to forest management practices, social perceptions, and climate change.

Through the fall and winter, we will to continue to reach out to state wildlife and natural resource managers for opportunities to apply regional climate and impact scenarios to moose and other management plans. We are especially interested in working with agencies to look at how their current or proposed management plans function under the different conditions represented by multiple, plausible futures.

A cow and two calves in open forest in the Adirondacks, NY. Source: P. Schuette.

Project timeline

PHASE 1–2

NEAFWA meeting Newport, RI
North American Moose Conference
National Adaption Forum
Northeast Moose Group Meeting
NY-DEC scenario planning exercise

Apr | May | Jun | Jul | Aug | Sep | Oct

2015

Science synthesis webinar
NY-DEC Moose Meeting
Work with managers/decision makers to apply in existing planning
Refining regional scenarios with NE-CSC

Using: planning & implementation

Scenario building & refining

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Cover Photo: Osgood River in the Adirondacks, NY.
Source: C. Pershyn

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